Examination of Finland Integrated Water Management Sample of EU's Hydro Political Approach for Sustainable Ecological Planning

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Abstract

First rule of sustainable ecological planning is to maintain continuously the balance between available amount and demand of ecological resources. A water resource, which is one of the most important ecological resources, is one of the resources that must be protected with priority since it is one of the most initial conditions of continuity of life. Upon this perspective, EU countries are developing various water policies and calling attention to the effects of insensibly usage of water on the ecology. Among EU countries, Finland is a very rich country in terms of water resources. According to water quality charts, Finland is at the top of the list among 122 countries within the scope of UN World Water Evaluation Report of World Water development reports issued in 2003. Additionally, it is one of the richest of 147 countries evaluated according to the water poverty index which was conducted by World Water Council and British Center for Ecology and Hydrology. Finland has developed many policies for sustainable use of this ecological value of its, and has made progress on many aspects from resource preservation to wastewater reclamation. Purpose of this study is to reveal AB hydro politic approaches and to examine water policies of Finland which conducts integrated water management. This study subject has been presented verbally at the International Conference on Civil and Environmental Engineering in 2015.

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1. Introduction

The importance of water on living organisms is indisputable. The history of water starts with the history of the human kind and the water management varied in every century and in every society. The fact that water is a resource that crosses the borders and is affected by any kind of change in the ecosystem makes it difficult to sustainably manage it. Whereas in and before the 19th century, to be near the water sources for water usage was the dominant idea, after this century this became difficult because of population density and rapid urbanization. The countries are developing their water management mentality with the developing technology and economical-political regulations. Particularly recently, the environment aspect of the water has been discussed beyond the fact that water is a social benefit and an economical resource. Due to the fact that water is a resource beyond borders, it makes it essential to carry out the water management with an international consideration.

For this purpose, the member countries of the European Union developed various policies with respect to environment and water resources as to move together in connection with the issues of water resources. Thus, in 1995 the European Institutions decided that the Community required a main revision and reconstruction process regarding the water policy (Karadağ, 2006). The Commission that has the opinion that a more global approach is needed concerning water policy accepted the requests from the European Parliament Environment Commission and the Committee of Environment Ministries in Europe. As a result of the consultations carried out with all the relevant parties such as local and regional administrations, water suppliers, industry and agriculture sectors, consumers, environmentalists, non-governmental organizations, the Commission accepted to prepare "an Environment Directive" in February 1997. The aim of this proposal is to supply sufficient potable water; sufficient water supply for other economical requirements (industry, agriculture, fishery, transportation, hydroelectric plants, energy production and recreation requirements); protection of water resources and water ecosystems; reducing the negative effects of floods and droughts (Karadağ, 2006). The development of the water policy history of the European Union

can be divided into three periods: 1st period: In this period that covers the 1970s and 1980s where the main subject was "public health", regulations were legislated regarding the quality of potable water, swimming water and the quality of the water in aquaculture. 2nd period: In the 1990s, it was mainly targeted to "reduce the pollution" and *Urban Waste Water Treatment* and *Nitrates* Directive was adopted which is one of the major legislative regulations pertaining to the water resources. 3rd period: For 2000s and thereafter, the main subject is projected as "integrated management and sustainable usage", whereas the legislative regulations are projected as the Water Framework Directive and the integration of the directives for potable water and swimming water (Akkaya, 2006).

With the Water Framework Directive that took effect in 2000, it was targeted to protect and control – not only quantitative but also qualitative- all the water resources within the EU borders. Consequently, a comprehensive policy is put forth for the protection of the European Waters according to a common standard (Anonymous a, 2018). The important milestones described by the Directive are shown in Table 1 and the total water resources of the European Union countries are graphically shown in Figure 1.

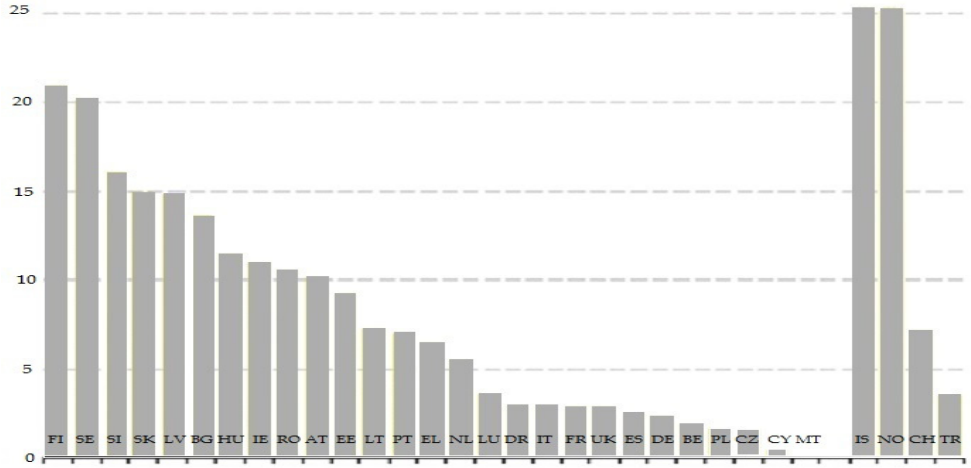
In this study, it will be discussed how Finland, which used to be a small and underdeveloped colonial country and then becomes today one of the countries with the highest industrial and commercial incomes, is managing its hundreds of lakes and other water resources with a sustainable water management.

Table 1: The important milestones

The Directive took effect	2000
Harmonizing with national legislation	2003
Identification of the river basins and the concerning authorities	2003
Characterization of the river basins: polluting resources and economical analysis	2004
Establishing monitoring networks	2006
Cooperation with the public	2006
Presentation of the draft management plans for river basins	2008
Finalization of management plans for river basins (including measuring programs)	2009
Constituting pricing policies	2010
Conducting operational measuring programs	2012
Access to environmental targets	2015
The end of the first management cycle	2021
The end of the second management cycle, deadline to reach the goals	2027

Source: Anonymous a, 2018.

Figure 1: The total water resources of the European Union countries, 2010



Source: Environmental statisticsatistical Books, 2010.

The population of Finland is 5.38 million and the total surface area is 370807 km², including coastal waters (European Commission, 2012). Its population is 5.3 million. 60% of its population is resident in urban areas. The average population density is 17/km² (Anonymous b, 2015).

Finland is very rich in freshwater resources. Particularly the greatest part of the Eastern Finland composes of lakes. The important lakes are the lakes Saimaa and İnari. The rivers Kemi and Oulu are important water resources. The Lakes, Rivers and Use of Water in Finland shown in table 2.

Table 2: The Lakes, Rivers and Use of Water in Finland

Lakes
Number of lakes and ponds larger than 0.0005 sq km 188 000
Number of lakes larger than 0.01 sq km 56 000
Number of lakes larger than 100 sq km 47
Largest lake is Lake Saimaa with a surface area of 4 380 sq km
Rivers
Total river flow 3 300 m³/s
Largest rivers are the Vuoksi and Kemijoki Rivers average flow 610 m³/s
Use of Water
Amount of water pumped by water works 408 mill.m³/year
Water consumption of communities per hook-up 242 I/day
Water abstraction by the industrial sector 9 500 mill.m³/year

Source: Ministry of Environment and Forestry Publications, 2009.

Finland attaches great importance to the protection of the environment. The main topic is especially the protection of the water. The Remote Sensing technology they have used even in 1970's could be an example the importance attached to this topic. In 1970's, while hydrological plans were made; great importance were given to the forestry, agricultural activities and geology of the country. Considering that conducting studies that are not suitable with these topics would not be sustainable, Finland could continuously control by using the sensors mounted on the planes the different formations on its soil and their change in time (Tokmanoğlu, 1977).

2. Material and Method

The main material of the study consists of EU water policies, water resources of Finland a member country of the EU and the sustainable management of these resources. Being very rich in freshwater resources, Finland is one of the most successful examples among the EU countries in sustainable management of these resources. In the study, Finland has been chosen the subject of the study as it is one of the richest in the world in terms of access, usage and ecological sustainability of water resources. In order to carry out the research it was benefited from the following:

- European Union Water Framework Directive,
- Finland Ministry of Environment and Forestry,
- Embassy of Finland,
- Water Association of Finland,
- Pepesec Energy Planning documentation,
- Europe Environment Statistics,
- European Commission,
- Charts and maps that give information regarding Finland water resources, studies, articles, books, inventory, congresses from which it could be benefited regarding the subject of the study, data obtained from Internet surveys about the subject and bilateral discussions.

3. Finland Water Management

10% of the total surface area of Finland is composed of lakes, rivers, and rivers.Water resources per inhabitant is the greatest in eastern and northern parts of the country, while the coastal regions of western and southern Finland with the highest population density there There are fewer sources for abstraction of high-quality drinking water.

Finland is one of the most northerly countries of the World. The lakes in the region are covered with ice for 5-7 months. However, especially in western Finland the climate is mild and the floods are quite common (Ministry of Environment and Forestry Publications, 2009).

According to the water poverty index developed by the World Water Council and UK Centre for Ecology & Hydrology, Finland is one of the richest among the 147 countries that have been evaluated in terms of capacity, water resources, access, usage and ecologic sustainability. In Finland, the renewable freshwater resources per capita are 1700 m^3. The

percentage of water used for other purposes is only 2.2% of the renewable water resources. However, the aim is effective water consumption with a global approach. It is estimated that the amount of renewable water resources in Finland is 17 billion m^3 per year. 2% (2.4 billion m^3) of the total resources is, at the moment, usable every year (Anonymous b, 2015).

Although Finland built the water service systems after declaring its independence in 1917, the construction of the many were completed in 1960's -70's. According to the official statistics, 90% of the population is connected to the public water distribution networks. More than 80% of the population is being served by sewerage systems and urban wastewater treatment facilities. Aside from the fact that there are plenty of water resources, there has been progress on sustainable water management thanks to the recent studies for enhancing water quality (Heino et.al., 2011).

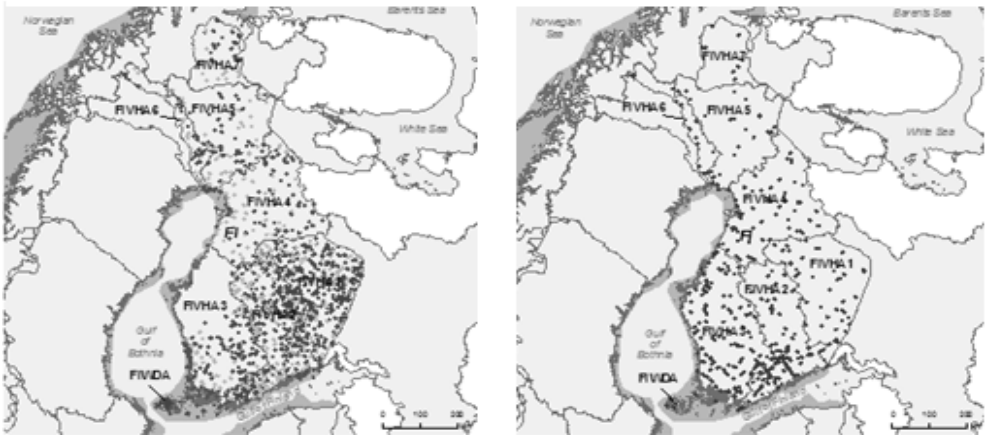
In Finland, new approaches have been developed for water protection; significant progress has been made from industrial and urban municipality resources to the wastewater treatment facilities. The best example to this is the results of the Water Protection Program carried out within the scope of European Energy Planning Projects. The Water Protection Program sets quantitative water protection targets for primary sectors including agriculture, industry and municipalities. The primary objective of this study, the partners of which are institutions such as Finnish Ministry for Foreign Affairs, Finnish Ministry of the Environment, Finnish Ministry of Agriculture and Forestry and Finnish Institution of Environment, is to prevent or reduce eutrophication. After all, it was determined that the water quality has increased even around the towns and industrial facilities and that there have been significant improvements as a result of the long-term precautions for water protection. In the inner waters of Finland, the water levels and flows are regulated by other structures connected to dams, water jumps or hydroelectric plants. The total area of the lakes is approximately one third of the surface area of the country and there are around 300 lakes. There are a total of 200 water level regulation projects. Most of the water level regulation works were carried out between 1950's and 1970's to reduce floods, produce hydroelectricity and to facilitate water transportation and water access. More recently, bringing concepts such as the protection of the nature and water amusement to the agenda caused a development in the attitudes against inner waters (Anonymous b, 2015).

There is a very effective river basin management plans in Finland. All Finnish River Basin Management Plans were published on 10.12.2009, and

reported to the Commission on 19.03.2010. Fairly good common structure of the River Basin Management Plans mostly following the Water Framework Directive requirements. Programmes of measures give guidance for implementation, enforcement and control, and annual action plans are compiled to complement the planning hierarchy. And there is a very developed monitoring network in Finland. They have a lot of rivers, lakes, transitional water, coastal water, unclassified surface water, groundwater monitoring stations (European Commission, 2012). The water monitoring stations in Finland are shown in Figure 2.

The Finnish Ministry of Agriculture and Forestry provides for multiple purposes such as hydropower generation, flood protection, water abstraction, water traffic and recreational use of water. This is due to the Ministry's aim of making the water resources sustainable in a socially, economically and ecologically (Ministry of Environment and Forestry Publications, 2009). The ecologic values of the water resources in Finland are shown in Figure 3.

Figure 2: The water monitoring stations in Finland



Source: European Commission, 2012.

Figure 3: The ecologic values of the water resources in Finland

Source: Anonymous f, 2015.

The Finnish Government approved the Water Policy Policy Outlines to Year 2015 in 2006. Thus, five water conservation targets were set to improve water quality.

- Achieving good water quality
- Combating eutrophication
- Targeting agricultural emissions
- Nitrogen removal to be intensified
- Social impacts (Review of the International Water Researches Management Policies and Actions, 2007).

3.1. Water services in Finland (supply and distribution)

Supplying and distributing water services includes:

1. Freshwater collection,
2. Waste water collection,
3. Treatment.

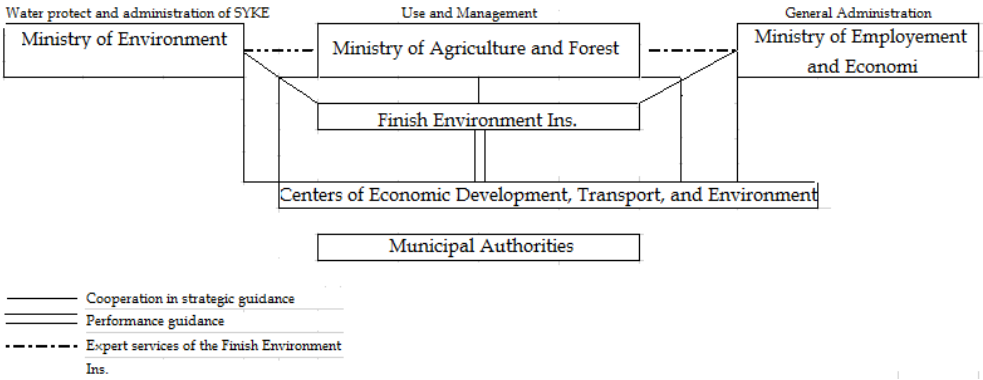
The surface water or water collected from underground reserves is treated and then distributed to the consumers as the public water resources. After being used, water is collected by sewerage systems, treated at waste water treatment facilities and then distributed to be used where suitable. The policies for water supplying, usage and sewerage systems

have been developed to guarantee quality potable water reserves and to keep its durableness. Another important aspect is the proper collection of the waste water and the treatment thereof conforming to the acceptable standards. The pricing policies include water supply and sewerage systems and the costs are fairly distributed among the consumers. Public services are given by central or local administrations and financed by taxes. The most important direct tax is the local tax of 15% to 20%, varied by municipality, collected by the municipalities from the residents (Anonymous b, 2015).

3.2. Municipalities mainly responsible for water services

In Finland, the use of water by the public is made by water and sewerage networks belonging to the municipalities. The municipality carries out this service through semi-autonomous municipal operations. (Anonymus c, 2018).

Figure 4: Water Resources administration in Finland



Source: Ministry of Environment and Forestry Publications, 2009.

3.3. Preparing for exceptional circumstances

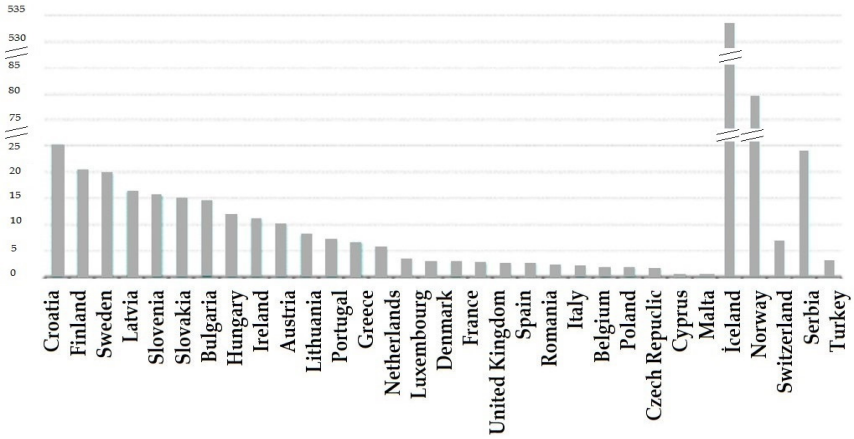
In Finland, it is very important to be protected from the devastating effects of floods. Initially, flood maps and general flood risk management plans were prepared (Ministry of Environment and Forestry Publications, 2009).

3.4. Water cooperation across the borders

Finnish border neighbors have signed bilateral agreements with Sweden, Russia and Norway for the management and sustainable use of common river systems. The European Union and its Member States participate in international water operations within the United Nations and other forums. Finland is an active party to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention) of the United Nations Economic Commission for Europe UNECE (Ministry of Environment and Forestry Publications, 2009).

In Table 3, the position of Finland is shown among the other European countries in terms of water usage and in Table 4 the position of Finland is shown among the European countries in terms of water resources.

Figure 5: The position of Finland among the other European countries in terms of w.u.



Source: Anonymus d, 2015.

Table 3: The position of Finland among the other European countries in terms of w.u.

Belgium	28,9	16,6	12,3	7,6	15,6	19,9
Bulgaria	69,8	52,3	18,1	89,1	108,5	107,2
Czech Rpublic	54,7	39,4	15,2	0,7	16	16
Demark	38,5	22,1	16,3	0	1,9	16,3
Germany	307	190	117	75	182	188
Estasia	29					
Relasd	80	32,5	47,5	3,5		510
Greece	115	55	60	2		72
Spalis	346,5	235,4	111,1	0	111,1	111,1
France	500,8	320,8	175,3	1	168	186,3
Croana	65,7	40,1	23			
Italy	241,1	155,8	167	80	155	175
Cyprus	3	2,7	0,3		0,1	0,3
Lithvania	42,7	25,8	16,9	6,8	32,9	33,7
Luxembougrg	2	28,5	15,5	9	25,9	24,5
Hungary	55,7	1,1	0,9	0,7	1,6	1,6
Malite	150,4	48,2	7,5	168,9	115,7	116,4
Netherlands	31,6	72,5	0,1			0,1
Austria	98	21,3	8,5	81,2	86,3	89,7
Polasd	193,1	43	55	29	84	84
Portagal	82,2	138,3	54,8	8,3	63,1	63,1
Romania	154	43,6	38,6	35	34	73,6
Slovenia	31,7	114,6	39,4	2,9	19	42,3
Sloccekra	37,4	13,2	18,6	3,5	32,2	32,1
Finland	222	24,3	13,1	67,3	81,7	80,3
Sween	342,2	115	107	32	110	110
Vnited Kirgdom	275	169,4	112,5	37	105,2	188,2
Celand	200	117,2	157,9	64	164,3	164,3
Norway	470,7	30	170		170	170
Switterland	61,6	112	371,8	22	384	384
FYR of Macedonia	19,5	21,6	40,7	28	53,5	53,5
Serrba	56,1			10	6,3	
Turkey	503,1	43,3	12,8	162,6	175,4	175,4

Source: Anonymous d, 2015.

3.5. Ground water resources in Finland

Finland has plenty of ground water resource. The usage policy of ground water is shaped as follows:

1. Quality of ground water,
2. Predicted risks for the quality of ground water,
3. Management of the ground water resources.

In Finland approximately 6350 aquifers were analysed and reserve areas were determined. As a result of the analysis, it was found that more than half of these reserves were usable for water supply (Anonymous e, 2015).

4. Conclusion

The EU water policies are directed by the member countries which are not encountered with the globalization and intensive user oppression, where there is supply and equilibrium, which do not have any problem

about the amount or quality of the water. As the existence of water has vital importance for a country, the EU water legislation is concentrated on the negative impacts of wrong water usage over ecosystems and to prevent such impacts. The protection and improving the existing resources are two main complementary aspects in terms of quality and amount management. In the water management policies developed by the countries, especially the protection of ecosystems should be brought to forefront and its important role in economical development should be thrown out of focus. Wrong water usage should be considered as the leading risk that affects the water quality negatively. However, in today's world, a majority of the countries consider the management of their water resources as a political tool that steers the infrastructural and regional development policies rather than considering it as an environmental topic.

Finland is the leading country among the exemplary countries in the world with their water management approach. With its water management decisions, Finland serves for the sustainable usage of water not territorially but also in global scale. Although the awareness of the people and the water managers has been somewhat increased by the recent studies on the water perception in our country, the fact that many different laws are in force and that many different institutions take roles in water management causes complications in planning. The legislations in Turkey that implement on different branches of environment should be transformed so that they could complete each other. Because, the fact that different institutions bear the responsibilities for harmonizing the legislations causes a grey area for authority. Notably, the regional authorities and responsibilities should be given to the authorized organizations as to overcome the problems and provide the sustainable water management in the region. It is crucial for our country to protect the water usage from subscale to upper scale suitable for the future projections by determining regional and territorial strategies. In order to provide planning integrity, by taking into consideration the EU Water Framework Directive in the studies with special and general purposes, the harmonization period will be accelerated. Turkey's water policy is based on the development of water resources, whereas the EU countries have already achieved this and focus on the effective and sustainable usage of the existing resources. In order also for providing the sustainability of resources while meeting the water demand of developing Turkey arising from the rapid urbanization and industrialization, first of all, a detailed data inventory should be prepared.

In order to watch any kind of change on the resources, a resource monitoring system should be established. The planning of water basins and cross border waters should be carried out in accordance with the Water Directive. All concerning agencies and institutes should join the planning and "those who use pay for it" approach that covers all sectors should be strengthened. Waste water treatment should be improved with an integrated water management policy. International cooperation should be conducted. Trainings should be provided to raise the awareness of the public.

List of References

Akkaya, C., Efeoğlu, A., Nedim, Y., 2006. Avrupa Birliği Su Çerçeve Direktifi ve Türkiye'de Uygulanabilirliği, *TMMOB Su Politikaları Kongresi Bildiriler Kitabı*, Cilt.1, ss. 195-204.

Anonymus a, 2018. http://www.tubitak.gov.tr/tubitak_content_files/vizyon2023/csk EK-2.pdf, Erişim Tarihi: 13.03.2018.

Anonymus b, 2015. http://www.finland.org.tr,/public/default.aspx?nodeid=39099, Erişim Tarihi: 14.11.2011, 10.03.2015.

Anonymus c, 2018. http://www.vesiyhdistys.fi/english.html/, Erişim Tarihi: 09.03.2018.

Anonymus d, 2015. http://ec.europa.eu/eurostat/statistics-explained/index.php/Water_statistics, Erişim Tarihi: 09.03.2015.

Anonymus e, 2015. http://www.environment.fi/en-US/Waters, Erişim Tarihi: 12.11.2015.

Anonymus f, 2015. http://mmm.multiedition.fi/eva/2015/1-2015/index.php?_nlid=9604, Erişim Tarihi: 02.10.2015.

Environmental Statistical Books, 2010. Edition Environmental Statistics and Accounts in Europe. ss 139.

European Commission, 2012. Commission Staff Working Document, *Report From The Commission To The European Parliament and The Council, River Basin Management Plans*, ss. 1-66.

Heino, O. A., Annina J. T. and Tapio S. K., 2011. Challenges to Finnish Water and Wastewater Services in the Next 20–30 Years, *Submitted to:E-WAter Official Publication of the European Water Association* (EWA), ss.6.

Karadağ, A.A., 2006. Avrupa Birliği Su Politikaları Çerçevesinde Türkiye'deki Su Kaynakları Yönetiminin Değerlendirilmesi, *TMMOB Su Politikaları Kongresi*, Cilt: 1, ss. 210-219.

Ministry of Environment and Forestry Publications, 2009. *Use and management of water resources in Finland, Government Helsinki*, Finland, ss.1-8.

Tokmanoğlu, T., 1977. Finlandiyalı Ormancıların Finlandiya'da ve İran'da Yaptıkları Remote Sensing Çalışmaları, *İstanbul Üniversitesi Orman Fakültesi Dergisi*, Seri B, Cilt 26, Sayı 2, ss. 22-23.

Review of the International Water Researches Management Policies and Actions, 2007. *Enviremental Protection Department Practise in Their Envorınmental and Strategic Environmental Assessment Final Report*, EDMS (Hong Kong), ss. 13.